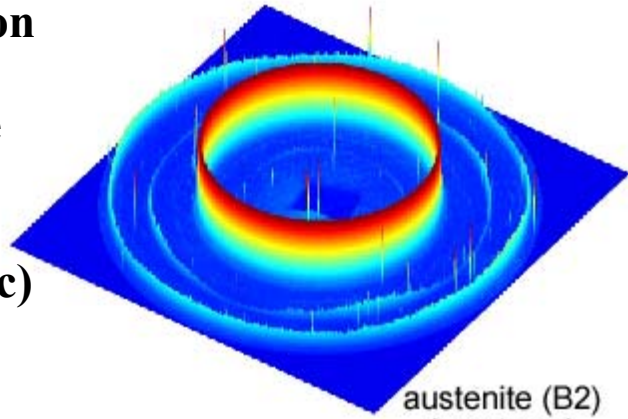
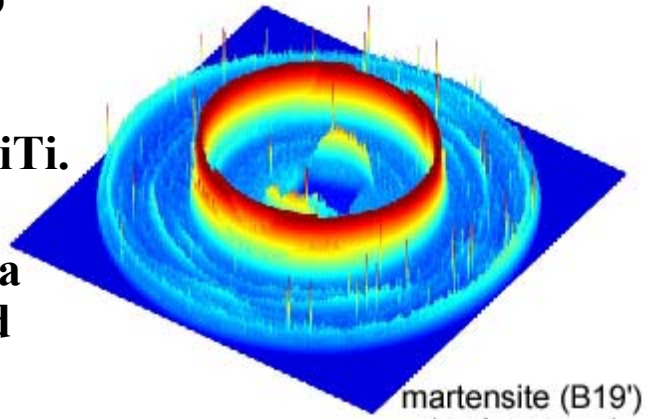
# CAREER: Neutron, Synchrotron X-ray Diffraction and Instrumented Indentation Studies of Deformation in Shape-Memory Alloys

Raj Vaidyanathan, University of Central Florida

DMR 0239512 (Start date: February 1, 2003)

- **A methodology has been established to analyze synchrotron X-ray diffraction spectra (from Argonne National Laboratory) for determining the texture, strain and phase fraction evolution *in situ*, during loading of superelastic NiTi. Representative spectra are shown to the right, corresponding to no load (austenitic) and load (martensitic) conditions.**
- **Work is ongoing that is using neutron diffraction on the Spectrometer for Materials Research at Temperature and Stress (SMARTS) at Los Alamos National Laboratory to study (i) the effects of cold-work on the stress-induced transformation in NiTi and (ii) reasons for the tensile-compression asymmetry during loading in martensitic NiTi.**
- **Preliminary instrumented indentation experiments have succeeded in demonstrating that deformation phenomena associated with the shape-memory effect can be captured from representative load-depth responses.**



# CAREER: Neutron, Synchrotron X-ray Diffraction and Instrumented Indentation Studies of Deformation in Shape-Memory Alloys

Raj Vaidyanathan, University of Central Florida

DMR 0239512 (Start date: February 1, 2003)

- **The project is shaping research and communication skills of four graduate students and two undergraduate students.**
- **Lectures on materials science and engineering (with shape-memory alloy demonstrations) were prepared and delivered in partnership with the Minority Engineering and Computer Science Program and at the Florida Department of Transportation's Engineer for a Day program. The picture on the right shows school students being introduced to engineering and playing with shape-memory alloys in the PI's lab, i.e., watching shape changes by immersing shape-memory alloys in warm water.**